

LECTURE SCHEDULE FOR SPRING SEMESTER 2006-2007

PH-102 B. Tech. FIRST YEAR

L	T	P
3	1	2

- 1-3 Wave particle duality, phase velocity, group velocity, wave packets, electron diffraction, Davisson-Germer experiment.
- 4 Uncertainty principle and thought experiments (electron diffraction by single slit, measurement of position by a microscope).
- 5-8 Schrodinger wave equation (time dependent and time independent), wave function and its interpretation, stationary states and their energies, operators, expectation values, particle in a box (one dimensional), one dimensional harmonic oscillator.
- 9-16 Frank Hertz experiment, quantum numbers, angular momentum quantization, space quantization, normal Zeeman effect, electron spin, Stern-Gerlach experiment, vector-atom model, representation of atomic states using LS coupling scheme, fine structure of H_{α} line, idea of anomalous Zeeman effect.
- 17-19 Basic ideas of laser (spontaneous emission, stimulated emission, absorption), Ruby and He-Ne Lasers, Einstein's A and B coefficients, holography.
- 20-21 Elementary ideas about lattices, structure of simple cubic, B.C.C. and F.C.C. lattices, packing fraction.
- 22 Elementary discussion of heat capacity, Einstein's model.
- 23-24 Free electron theory of metals, Fermi energy and surface, density of states (one, two and three dimensional electron gas).
- 25-27 Electron in a periodic potential, origin of the energy gap, energy bands in solids, classification of solids into metals, semiconductors and insulators, optical absorption in semiconductors.
- 28-29 Elementary discussion of electrical conductivity of metals and semiconductors, Wiedemann-Franz law.
- 30-32 Magnetic properties of solids: Langevin diamagnetic susceptibility, Curie paramagnetic susceptibility, Curie-Weiss ferromagnets.
- 33-34 Superconductivity: essential properties of superconductors (Zero resistivity, Meissner effect, critical field, critical current, isotope effect, heat capacity, energy gap), type I and type II superconductors.
- 35-37 Nuclear size, nuclear masses, binding energy, nuclear force, liquid drop model: semi-empirical mass/binding energy formula.
- 38-40 Nuclear fission: spontaneous and induced fission; nuclear fusion: proton – proton and carbon cycles, source of energy of stars.

Books recommended: Concepts of Modern Physics - Arthur Beiser
Introduction to Solid State Physics - Charles Kittel
Optics - Ajoy Ghatak
Physics - Halliday, Resnick & Krane